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NORTHEASTERN RESEARCH NOTES

NORTHEASTERN FOREST EXPERIMENT STATION
UPPER DARBY PA R. W. MARQUIS DIRECTOR

DISTANT EARTHQUAKES AFFECT LOCAL GROUND-WATER LEVELS

Earthquakes are rare in the Northeast. So when a catastrophic earthquake occurs in far-off India or Chile we are apt to shrug our shoulders and dismiss the subject as being momentarily interesting but of no immediate concern to us. This is not so. Distant earthquakes may change the level of the ground water under our very feet.

The Delaware-Lehigh Experimental Forest, an area set aside by the Pennsylvania Department of Forests and Waters for cooperative studies of the effects of forests on our water supply, is located in an isolated area of the Pocono Mountains of eastern Pennsylvania. There is mounting evidence that this quiet area is not beyond the reach of earthquakes that occur on the other side of the globe.

The Evidence

Three deep wells were drilled at the Delaware-Lehigh Experimental Forest for the pur-

pose of recording changes in the elevation of the water table. Normally the curves traced by the automatic recording devices as the water table fluctuates are gentle curves.

But on August 15, 1950, the day of a catastrophic earthquake in Assam, India, the ground-water curve for one of these wells oscillated violently for a period of 3 hours, and less violently for 2 hours more. In other words, for a period of 5 hours the water in the well continually rose and fell. At the peak of this period, it rose and fell a total of 0.05 feet.

And in August 1949, when the coast of British Columbia experienced a severe earthquake--some 2,500 miles away--the level of the water in one well dropped 0.04 feet. There were no oscillations; it simply dropped down--and stayed there permanently.

At the same time, the water level in another well behaved in a most peculiar fashion. First it dropped 0.02 feet; then it immediately rose a total of 0.07 feet; and finally it settled at a point 0.01 feet above its original level.

Why It Is Important

If these instances were isolated cases, we could dismiss the phenomena as unimportant. But apparently the effect of distant earthquakes is continually being felt here. Thus far the ground-water level at the experimental forest has been affected by distant earthquakes every 8 to 12 days. (The ground-water-level records are checked against U. S. Coast and Geodetic Survey notices of earthquakes throughout the

world.)

Since more than a million earthquakes shake the earth every year, it seems possible that over a long period of time the cumulative effect of earthquakes on the ground-water level may be rather significant.

During the short time that effects of earthquakes have been recorded at the experimental forest, no pattern or trend of effects has been observed. The water level in a well may be changed permanently in either direction or not at all.

Observations Continue

A great many observations must be made all over the country, and for an extended period, before the general effects of distant earthquakes on ground-water levels can be ascertained. The Northeastern Forest Experiment Station is continuing to record these effects at the Delaware-Lehigh Forest.

The information gathered is reported to the U. S. Geological Survey. This information will be collated with similar data from other parts of the country.

Meanwhile we are continuing to analyze the changes in ground-water levels at the Delaware-Lehigh Experimental Forest in an effort to determine what permanent effects--if any--are resulting from distant earthquakes.

--NEDAVIA BETHLAHMY

STOCKING IN SPRUCE-FIR STANDS

One of the objectives of forest management is to control the level of growing stock at a point that will give the best yield of desired products. How variable stocking can be in the spruce-fir types of Maine, in the absence of conscious management, is shown by data from four 300-acre tracts in the northern part of the State.

Each of the four tracts averaged better than 10 cords of spruce and fir per acre, and contained the four principal types of the region; spruce-fir, red spruce-yellow birch, red spruce-sugar maple-beech, and beech-birch-maple. Two hundred thirty-one plots were established on the tracts and for each the basal area per acre in square feet for all trees in the 1-inch class and larger was computed. The distribution of the plots by square-feet-per-acre classes and forest types is shown below.

Distribution of plots (in percent) by basal area per acre and types

Basal area per acre (sq.ft.)	Spruce-fir	Red spruce-yellow birch	Red spruce-sugar maple-beech	Beech-birch-maple	All types
Less than 80	5	6	3	6	5
80 - 99	7	15	10	37	13
100 - 119	26	14	41	38	25
120 - 139	30	33	31	7	29
140 - 159	16	17	15	6	16
160 - 179	13	14	0	6	10
180 - 199	3	1	0	0	2
Total	100	100	100	100	100

Five-year remeasurements of these plots are planned for 1953-55. Growth data from the remeasurements will permit at least tentative conclusions as to optimum stocking for each major type.

--THOMAS F. McLINTOCK

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